Overview of Pollution Prevention (P2) GHG & Cost Calculators

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Natalie Hummel

Office of Chemical Safety and Pollution Prevention

Pollution Prevention Division

Hummel.Natalie@epa.gov

202-564-1424

Location of P2 Tools

- http://www.epa.gov/p2/pubs/resources/measurement.html#calc

- http://www.p2.org/general-resources/p2-data-calculators/

Today's Agenda

- Review the Greenhouse Gas Calculator
  - Calculate GHG reductions from P2 activities*
- Review the Pollution Prevention Cost Calculator
  - Calculate cost savings from P2 activities*
- Describe the Hazardous Materials Calculator
  - Converts gallons to pounds for common hazardous materials

*Performance results reported on annual basis

Purpose of Calculators

- The calculator is tailored to the P2 program, its partners, and its grantees.
- NOT intended to calculate a program's GHG footprint, which is a measure of a program's entire GHG emissions for all operations.
- World Resources Institute and The Climate Registry offer recognized greenhouse gas inventories and guidance for this purpose.

Background

- Assist P2 community in reporting EPA's outcome measures:
  - Million metric tons of carbon dioxide equivalents;
  - Pounds of hazardous materials reduced;
  - Gallons of water saved, and
  - Dollars saved through the adoption of P2 practices
- Enhance standardization for reporting performance results.
- Enhance transparency of methodologies.

P2 GHG Calculator

- The GHG Calculator is a tool to calculate changes in GHG emissions from P2 projects.
- Converts the activity values entered (e.g., kWh saved, gal. water reduced, etc.) to CO_2e
- Aggregates GHG reductions from individual projects and categories.
- Transparency for data sources through references and justification.

P2 GHG Calculator Addresses:

- Electricity Conservation
- Green Energy (wind, solar/green energy certificates)
- Stationary and Mobile Source Fuel Reduction/Substitution (with lower GWP)
- Greening Chemistry (with lower GWP)
- Water Conservation
- Materials Management (*under construction*)

P2 Cost Calculator Addresses:

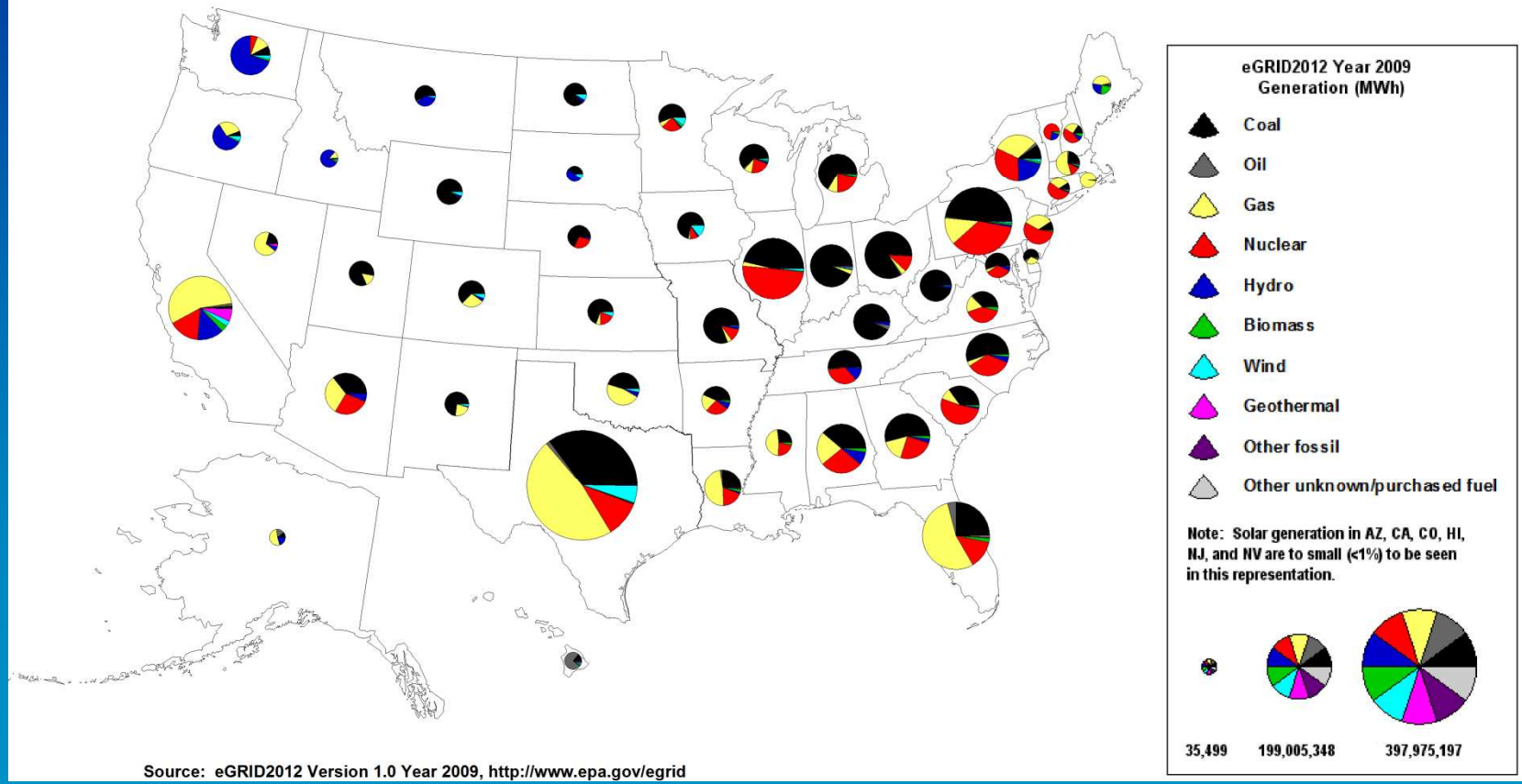
- Financial value of reducing:
  - Hazardous Inputs and Wastes
  - Air Emissions
  - Water Pollution
  - Water Use
  - Fuel Use
  - Electricity Use
  - Non-Hazardous Inputs and Solid Waste

Electricity Conservation Projects

- **GHG Calculator: Electricity Conservation Tab**
  - Reductions from electricity conservation are based on state-specific emissions factors (e-GRID)
- **Cost Calculator: Electricity Tab**
  - Reductions in traditional electricity use will result in COST SAVINGS ($)

Electricity emission facts vary by location

Year 2009 Generation by Fuel Type



Source: eGRID2012 Version 1.0 Year 2009, http://www.epa.gov/egrid

Example 1: Electricity Conservation

GMC developed an electricity conservation program in their New Jersey facility that conserved 25,000 kWh.

INPUT

GHG Calculator: Electricity Conservation Tab

Electricity Conservation

State or US = NJ

Electricity Conserved = 25,000

Unit Reported = kWh

Cost Calculator: Electricity Use Tab

Electricity Conservation

State or US = NJ

Quantity Electricity Reduced = 25,000

Unit = kWh

OUTPUT

GHG Calculator = 14.391 $MTCO_2e$ (in emissions reductions)

Cost Calculator = $3,132.50 (in cost savings)

* Have ability to enter User Defined Unit Cost ($0.1040/kWh=$2600)

Ex. 1: GHG Calculator

	Electricity Conservation: GHG Savings from Electricity Conservation					
How to use this tab: Instructions to obtain $MTCO_2e$		Select a state or U.S. National to apply the state's emission factor or the national emissions factor. Enter the annual amount of electricity conserved and choose unit from the drop-down menu. The next column converts all units to kWh. The final column displays the reduction in $MTCO_2e$.				*Same Conse*
Calculation Description		$MTCO_2e$ = Electricity conserved * (kWh/user-specified units) * (national or state value of the eGRID non-baseload output emission rate [$MTCO_2e$/kWh]) National rate: 0.000709 $MTCO_2e$/kWh State rate: (0.000071 to 0.001131 $MTCO_2e$/kWh) *For national and state formulas and details see Notes below.* Both national and state versions of the rate (the eGRID non-baseload output emission rate) cover three gases: CO_2 emissions factor ($MTCO_2e$/kWh) + CH_4 emissions factor ($MTCO_2e$/kWh) + N_2O emissions factor ($MTCO_2e$/kWh).				MTCO bulb) non-b in MT *The re Electr*
	State or U.S. (Select)	Electricity Conserved (Input value)	Unit reported (Select)	Electricity Conserved (kwh)	GHG Reduction ($MTCO_2e$)	Numb replac
Example		GQ Co. worked with a facility in North Carolina that has conserved 10,000 kwh of electricity through a conservation activity.				GQ Co lightbu during
	NC	10,000	kwh	10,000	8.464	
Total Input- All Projects				**25,000**	**14.391**	
Project 1	**NJ**	25,000	kwh	25,000	14.391	
Project 2				-	-	
Project 3				-	-	
Project 4				-	-	
Project 5				-	-	
Project 6				-	-	
Project 7				-	-	
Project 8				-	-	
Project 9				-	-	
Project 10				-	-	

Ex. 1: Cost Calculator

	Electricity						
	This tab calculates dollars saved from conserving conventional electricity and net dollars spent purchasing calculated on this ta						
Type of Activity		Conserving Conventional Electricity					
How to use this tab		Enter the quantity of electricity conserved, selecting the appropriate unit. Enter the unit cost if known or select the state or U.S. National from the drop-down list to populate with the default state or national value. The Savings column converts data entries into dollars saved.					
Calculation Description		Quantity of electricity reduced (user specified units) * unit cost (user-specified or default) = Dollar savings.					
	State or U.S. (Select)	Electricity Conserved Quantity	Unit (select)	Unit Cost ($/unit just selected)	kWh Reduced	Dollar Savings	
Example		Installed energy-efficient lighting and reduced lighting and air conditioning usage at two commercial buildings.					
	NC	1,700,000	kWh		1,700,000	$	146,030
Total Input - All Projects					25,000	$	2,600
Project 1	NJ	25,000	kWh	$0.1040	25,000.00	$	2,600.00
Project 2		(Select)	(Select)		-		-
Project 3		(Select)	(Select)		-		-
Project 4		(Select)	(Select)		-		-
Project 5		(Select)	(Select)		-		-
Project 6		(Select)	(Select)		-		-
Project 7		(Select)	(Select)		-		-
Project 8		(Select)	(Select)		-		-
Project 9		(Select)	(Select)		-		-
Project 10		(Select)	(Select)		-		-

Green Energy Projects

- GHG Calculator: Green Energy Tab
  - Assumption: No GHG emissions associated with green power
  - 1 kWh of fossil-fuel electricity replaced with 1 kWh of renewably-generated electricity is the same as reducing electricity use by 1kWh
- Cost Calculator: Electricity Use Tab
  - Purchase of "green electricity" will INCREASE costs
  - Calculator uses state-specific data when available, or the national mean

Example 2: Green Energy Project

- GMC's New Jersey facility purchased 40,000 kWh of green electricity.

INPUT

GHG Calculator: Green Energy Tab

Green Energy Electricity Displacing Fossil Fuel Energy

State or US = NJ

Electricity Consumed from Renewable Energy = 40,000

Unit Reported = kWh

Cost Calculator: Electricity Use Tab

Purchased Green Electricity

State or US = NJ

Quantity Electricity Purchased = 40,000

Unit = kWh

OUTPUT

GHG Calculator = 23.025 $MTCO_2e$ (in emissions reductions)

Cost Calculator = -$7.40 (i.e., increased cost of $7.40)

Ex. 2: GHG Calculator

A	B	C	D	E	F	
Green Energy: GHG Savings from Shifting to Green Energy Sources						
Calculation Description		$MTCO_2e$ = Electricity conserved * (kWh/user-specified units) * (national or state value of the eGRID non-baseload output emission rate, expressed as $MTCO_2e$/kWh) National value of rate: 0.000692 $MTCO_2e$/kwh State value of rate: differs by state *For a detailed derivation of national conversion factors, see Notes below, where the formulas are presented with actual rates filled in.* Both national and state versions of the rate (the eGRID non-baseload output emission rate) cover three gases: CO_2 emissions factor ($MTCO_2e$/kWh) + CH_4 emissions factor ($MTCO_2e$/kWh) + N_2O emissions factor ($MTCO_2e$/kwh). *See Notes below for more detailed information.*				$MTCO_2$ specifi eGRID expres *The de as for C Fossil*
	State or U.S. (Select)	**Electricity Consumed from Renewable Energy (Input value)**	**Unit reported (Select)**	**Electricity Consumed from Renewable Energy (kwh)**	**GHG Reduction ($MTCO_2e$)**	Volum
Example		GQ Co. installed 2 wind turbines in NY producing 10,000 kWh annually.				
	NY	20,000	kwh	20,000	11.787	
Total Input- All Projects				**40,000**	**23.025**	
Project 1	**NJ**	40,000	kwh	40,000	23.025	
Project 2				-	-	
Project 3				-	-	
Project 4				-	-	
Project 5				-	-	
Project 6				-	-	
Project 7				-	-	
Project 8				-	-	
Project 9				-	-	
Project 10				-	-	

Ex. 2: Cost Calculator

	Electricity						
	This tab calculates dollars saved from conserving conventional electricity and net dollars spent purchasing green electricity. The Aggregate tab will reflect the net cost savings (positive or negative) calculated on this tab.						
Type of Activity		Purchasing Green Electricity					
How to use this tab		Work in this area only; all related cost trade-offs (user-specified or default) between buying green electricity and not buying conventional electricity will occur here. Enter the quantity of green electricity purchased, selecting the appropriate unit. For unit cost, enter the negative (use a negative sign) difference between conventional electricity cost and green electricity cost in the same units (green electricity costs more, producing a negative savings). If difference in unit cost is unknown, leave blank to use the state or national default value for the negative differential. The Dollars Spent column converts data entries into dollars spent (negative savings).					
Calculation Description		Quantity of electricity purchased (user specified units) * negative unit cost differential (user-specified or default) = Dollars spent.					
	State or U.S. (Select)	Green Electricity Quantity	Unit (select)	Unit Cost Difference ($/unit just selected)	Green kWh Purchased	Dollars Spent (negative cost savings)	
Example							
	NC	25,000	therms		732,708	-$22,963	
Total Input - All Projects					**40,000**	**$ (7)**	
Project 1	NJ	40,000	kWh		40,000.00	$ (7.40)	
Project 2		(Select)	(Select)		-	-	
Project 3		(Select)	(Select)		-	-	
Project 4		(Select)	(Select)		-	-	
Project 5		(Select)	(Select)		-	-	
Project 6		(Select)	(Select)		-	-	
Project 7		(Select)	(Select)		-	-	
Project 8		(Select)	(Select)		-	-	
Project 9		(Select)	(Select)		-	-	
Project 10		(Select)	(Select)		-	-	

Fuel Use Reduction Projects (Stationary Sources)

- GHG Calculator: Stationary Sources Tab
  - Calculate GHG emissions reductions associated with reduced fuel use
  - Includes emission factors for 14 common fuel types used to power stationary sources (high carbon intensity to low)
- P2 Cost Calculator: Fuel Use Tab
  - Calculates savings from reduced fuel use
  - Examples of data entry options include natural gas, heating oil, and biodiesel.

Example 3: Reducing Fuel Use from a Stationary Source Example

GMC altered its production activities resulting in a reduction of 15,000 therms of natural gas annually.

INPUT

GHG Calculator: Stationary Sources Tab

Natural Gas or Compressed Natural Gas

Natural Gas Reduced = 15,000

Units = therms

Cost Calculator: Fuel Use Tab

Natural Gas

Amount Natural Gas Reduced = 15,000

Units = therms

OUTPUT

GHG Calculator = 79.812 $MTCO_2e$ (in emissions reductions)

Cost Calculator = $9,923.85 (in cost savings)

Ex. 3: GHG Calculator

	Stationary Sources: GHG Savings from Using Less Fuel and Greener Fuels					
uel	Natural Gas or Compressed Natural Gas (CNG)				Biodies	
ow to use this tab: structions to obtain $MTCO_2e$	Enter the volume of natural gas or CNG reduced. Select from drop-down menu to indicate units. Next column converts the units into BTUs, and "GHG Reduction" converts the units into $MTCO_2e$.				Select biodiesel blend from drop-d B20 (20% biodiesel), or B100 (10 unknown, select "Blend Unknown B5). Enter gallons of biodiesel ble converts units into $MTCO_2e$.	
alculation Description	$MTCO_2e$ = Input Volume (BTU) * (5.35E-05kg CO_2e/ BTU) * (1 $MTCO_2e$ / 1,000 kg CO_2e) *See notes below for emission factor derivation.*				$MTCO_2e$ (B5; also Blend Unknown [0.05*(3.06 kg CO_2e / gal. biodiese gal. diesel)]^5 * (1 $MTCO_2e$ / 1,000 $MTCO_2e$ (B20) = Volume (gal.) * [0 biodiesel)+0.80*(10.5 kg CO_2e / ga 1,000 kg CO_2e) $MTCO_2e$ (B100)= Volume (gal.) * biodiesel)^5 * (1 $MTCO_2e$ / 1,000 kg *See notes below for emission fac*	
Example	GQ Co. replaced solvent bonding of plastic parts with ultrasonic bonding, thus reducing incineration of spent solvents and saving 10,000 therms of natural gas annually.				GQ Co. replaced 20,000 gallons o combustion turbine generator with biodiesel. (STEP 2 of 2. For STEP Fuel Oil or Diesel").	
	10,000	therms	1,000,000,000	53.208	B100	-20,0
	Natural Gas or CNG Reduced (Input value)	Units (Select)	Natural Gas or CNG Reduced (BTU)	GHG Reduction ($MTCO_2e$)	Blend (Select)	Biodiesel Reduced (gal)
otal Input- All Projects			**1,500,000,000**	**79.812**		
roject 1	15,000	therms	1,500,000,000	79.812		
roject 2				-		
roject 3				-		
roject 4				-		

Ex. 3: Cost Calculator

	Fuel					
	This tab calculates cost savings from using less fossil fuel or reducing activities which use fu from reduced vehicle travel, choose between vehicles miles reduced or motor gasoline (not b					
Type of Reduction	Natural Gas					
How to use this tab	Enter the quantity of natural gas reduced, selecting the appropriate unit. Enter the unit cost if known or leave blank to populate with default national value. The Savings column converts data entries into dollars saved.					
Calculation Description	Unit quantity of natural gas reduced * unit cost (user-specified or default value) = Dollars saved. The calculator formula converts all units to therms.					
Default Unit Cost	$0.6533 /therms					
	Amount of Natural Gas Reduced	Unit (select)	Unit Cost ($/unit just selected)	Therms Reduced	Dollar Savings	
Example	Green building reduced heat usage at two commercial buildings.					
	150,000	therms		150,000	$ 97,988	
Total Input - All Projects				15,000	$ 9,799	
Project 1	15,000.00	therms		15,000	$ 9,798.75	
Project 2		(Select)		-	$ -	
Project 3		(Select)		-	$ -	
Project 4		(Select)		-	$ -	
Project 5		(Select)		-	$ -	
Project 6		(Select)		-	$ -	
Project 7		(Select)		-	$ -	
Project 8		(Select)		-	$ -	
Project 9		(Select)			$	

Mobile Fuel Reduction / Substitution Projects

- **P2 GHG Calculator: Mobile Sources Tab**
  - Includes the ability to calculate savings from reduced vehicle and airplane miles
    - User enters *either* fuel reduced or vehicle/air miles avoided, *but not both*
- **P2 Cost Calculator: Fuel Use Tab**
  - Calculates savings from reduced fuel use
  - Examples of data entry options include vehicle miles driven and motor gasoline, jet fuel, etc.

Example 4: Reducing Air Miles Traveled

GMC upgraded its communications system allowing for greater adoption of videoconferencing, and saving 100,000 air miles traveled on short flights, and 800,000 air miles on long haul flights, avoiding 35 flights at an average flight cost of $700.

INPUT

GHG Calculator: Mobile Sources Tab

Air Miles

Length of Flight = multiple distances

Calculator for Air Miles Reduced over Multiple Distances

Short haul: <300 miles = 100,000

Long haul: >700 miles = 800,000

Cost Calculator: Fuel Use Tab

Air Travel

Number of Flights Avoided = 35

Average Cost per Flight= $700

OUTPUT

GHG Calculator = 178.268 $MTCO_2e$ (in emissions reductions)

Cost Calculator = $24,500 (in cost savings)

Ex. 4: GHG Calculator

Mobile Sources: GHG Savings from Reduced Fuel Use and Substitutions of Greener Fu

Fuel	Air Miles	Gasoline
How to use this tab: Instructions to obtain $MTCO_2e$	Select flight-length category from drop-down menu: short haul (<300 miles per one-way flight), medium haul (300 – 700 miles), long haul (>700 miles), multiple distances, or distance unknown. If miles are all in one flight-length category or all in distance-unknown category, enter number of air miles reduced. "GHG Reduction" converts the units into $MTCO_2e$, by appropriate formulas. If multiple flight-lengths are involved, select "multiple distances" from the drop-down menu and use the "Calculator for Air Miles Reduced over Multiple Distance Ranges" table below to enter miles per category. Click the "Calculate" button to populate the "GHG Reduction" column per project.	Enter number of gallons of gasoline reduced. "GHG Reduction" converts the units into MTC
Calculation Description	$MTCO_2e$ (short haul) = Volume (air miles traveled) * (0.28 kg CO_2e / mi)* * (1 $MTCO_2e$ / 1,000 kg CO_2e) $MTCO_2e$ (medium haul) = Volume (air miles traveled) * (0.23 kg CO_2e / mi)* * (1 $MTCO_2e$ / 1,000 kg CO_2e) $MTCO_2e$ (long haul) = Volume (air miles traveled) * (0.19 kg CO_2e / mi)* * (1 $MTCO_2e$ / 1,000 kg CO_2e) $MTCO_2e$ (unknown) = Volume (air miles traveled) * (0.27 kg CO_2e / mi)* * (1 $MTCO_2e$ / 1,000 kg CO_2e) *See notes below for emission factor derivation.*	$MTCO_2e$ = Input Volume (gal.) * (8.84 kg CO_2e gal) * * (1 $MTCO_2e$ / 1,000 kg CO_2e) *See notes below for emission factor derivation*
Example	New company policy on videoconferencing saved GQ Co. 100,000 air miles traveled on short flights over 3 years.	
	short haul: <300 miles: 100,000	27.985

	Length of Flight(s) (Select)	Air Miles Reduced (miles)	GHG Reduction ($MTCO_2e$)	Gasoline Reduced (gal)	GHG Reduction ($MTCO_2e$)
Total Input- All Projects		**900,000**	**178.268**	–	–
Project 1	multiple distances	900,000	178.268		–
Project 2			–		–

Color Key	**Calculator for Air Miles Reduced over Multiple Distance Ranges**		
		Air Miles Reduced (miles)	GHG Reduction ($MTCO_2e$)
User enters value			
User selects option from drop-down menu	**Project Total**	**900,000**	**178.268**
Do not change- calculation	**multiple distances**		
	short haul: <300 miles	100,000	27.985
	medium haul: >300 – <700 miles		–
	long haul: >700 miles	800,000	150.283
	distance unknown		–

Calculate

Ex. 4: Cost Calculator

	Fuel Use				
Type of Reduction	Air Travel			Crude Oil	
How to use this tab	Enter the number of flights avoided. Enter the unit cost of each flight. The Savings column converts data entries into dollars saved.			Enter the barrels of crude oil reduce known or leave blank to populate wit value. The Savings column converts dollars saved.	
Calculation Description	Number of flights avoided * unit cost of flight (user-specified) = Dollars saved.			Crude oil barrels reduced * unit cos default) = Dollars saved.	
Default Unit Cost				$101.02 /barrel	
	Flights Avoided (#)	Unit Cost ($/flight)	Dollar Savings	Reduced Barrels of Crude Oil	Unit Cost ($/bar
Example					
Total Input - All Projects	35		$ 24,500	-	
Project 1	35	$700.00	$ 24,500.00		
Project 2			$ -		
Project 3			$ -		
Project 4			$ -		
Project 5			$ -		
Project 6			$ -		
Project 7			$ -		

Example 5: Substituting Towards Greener Fuel

GMC upgraded half of its vehicle fleet to run on biodiesel B100 instead of diesel, saving 4,375 gallons of diesel annually.

INPUT

GHG Calculator: Mobile Sources Tab

Diesel

Diesel Fuel Reduced (gal.) = 4,375

Biodiesel

Blend = B100

Biodiesel Reduced (gal.)= - 4,375

Cost Calculator: Fuel Use Tab

Diesel Fuel Reduced (gal.) = 4,375

Biodiesel Reduced (gal.) = - 4,375

OUTPUT

GHG Calculator (Aggregate Tab) = 31.308 $MTCO_2e$ (in emission reductions)

Cost Calculator = $16,563.75 (reduction in diesel is cost savings) – $18,659.38 (in biodiesel costs) = $2,096 in additional costs

Ex. 5: GHG Calculator

Mobile Sources: GHG Savings from Reduced Fuel Use and Substitutions of Greener Fuels

This tab calculates GHG reductions from reduced fuel use as well as fuel substitutions by either quantity of fuel consumed or distance traveled. The tab is organized by the carbon-emissions intensity of fuels, from highest to lowest. When the option is provided, choose between reduced miles traveled or reduced fuel use (not both). To record a net fuel substitution, enter a negative value for the quantity of substitute fuel and a positive value for the quantity of fuel which has been discontinued.

Fuel	Diesel		Biodiesel			Ethanol (Corn
How to use this tab: Instructions to obtain $MTCO_2e$	Enter number of gallons of distillate fuel oil or diesel conserved. "GHG Reduction" converts the units into $MTCO_2e$.		Select biodiesel blend from drop-down: B5 (5% biodiesel), B20 (20% biodiesel), or B100 (100% biodiesel). If blend unknown, select "Blend Unknown" (selects conservative B5). Enter gallons of biodiesel blend. "GHG Reduction" converts units into $MTCO_2e$.			Select ethanol blend from drop-d gasoline), E85 (85% ethanol, 15% ethanol). If blend unknown, select conservative E10). Enter gallons c Reduction" converts units into MT
Calculation Description	$MTCO_2e$ = Input Volume (gal.) * (10.22 kg CO_2e / gal) * * (1 $MTCO_2e$ / 1,000 kg CO_2e) *See notes below for emission factor derivation.*		$MTCO_2e$ (B5; also Blend Unknown) = Volume (gal.) * [0.05*(3.06 kg CO_2e / gal. biodiesel)+0.95*(10.22 kg CO_2e / gal. diesel)]* * (1 $MTCO_2e$ / 1,000 kg CO_2e) $MTCO_2e$ (B20) = Volume (gal.) * [0.20*(3.06 kg CO_2e / gal. biodiesel)+0.80*(10.22 kg CO_2e / gal. diesel)]* * (1 $MTCO_2e$ / 1,000 kg CO_2e) $MTCO_2e$ (B100)= Volume (gal.) * (3.06 kg CO_2e / gal. biodiesel)* * (1 $MTCO_2e$ / 1,000 kg CO_2e) *See notes below for emission factor derivation.*			$MTCO_2e$ (E10; also Blend Unknow [0.10*(4.65 kg CO_2e / gal. corn-de kg CO_2e / gal. gasoline)]* * (1 MTC $MTCO_2e$ (E85) = Volume (gal.) * [0 corn-derived ethanol)+0.15*(8.84 (1 $MTCO_2e$ / 1,000 kg CO_2e) $MTCO_2e$ (E100) = Volume (gal.) *(4 derived ethanol)* * (1 $MTCO_2e$ / 1,0 *See below for more information o derivation.*
Example	GQ Co. replaced 20,000 gallons of distillate fuel oil in a turbine with 20,000 gallons of biodiesel. (STEP 1 of 2)		GQ Co. replaced 20,000 gallons of distillate fuel oil in a combustion turbine generator with 20,000 gallons of biodiesel. (STEP 2 of 2. For STEP 1, see the Stationary Sources tab, under "Distillate Fuel Oil or Diesel").			
	20,000	204.344	B100	-20,000	-61.223	
	Distillate Fuel or Diesel Reduced (gal)	GHG Reduction ($MTCO_2e$)	Blend (Select)	Biodiesel Reduced (gal)	GHG Reduction ($MTCO_2e$)	Blend (Select)	Corn Ethanol Reduce (gal)
Total Input- All Projects	**4,375**	**44.700**		**(4,375)**	**(13.393)**		
Project 1	4,375	44,700	B100	-4,375	(13,393)		
Project 2		-			-		
Project 3		-			-		
Project 4		-			-		

Ex. 5: GHG Calculator – Aggregate Tab

Aggregated GHG Reductions by Category and Project

This tab calculates the GHG saving results per project from all tabs. To name a project, enter the project name in the first column. The name entered will appear automatically as the project name on all other tabs. For example, if Project 1 is named "Line 2 Upgrade", the Project 1 field in all tabs will be populated as "Line 2 Upgrade".

	Electricity Conservation	Green Energy	Stationary Sources	Mobile Sources	Greening Chemistry	Water Conservation	Materials Management *(under construction)*	Total by project	Total by project
	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)*	Reduction in Million Metric Tons of Carbon Dioxide Equivalent ($MMTCO_2e$)**
Aggregate (All Projects)	-	-	-	31.308	-	-	-	31.308	0.000
Project 1	-	-	-	31.308	-	-	-	31.308	0.000
Project 2	-	-	-	-	-	-	-	-	-
Project 3	-	-	-	-	-	-	-	-	-
Project 4	-	-	-	-	-	-	-	-	-
Project 5	-	-	-	-	-	-	-	-	-
Project 6	-	-	-	-	-	-	-	-	-
Project 7	-	-	-	-	-	-	-	-	-
Project 8	-	-	-	-	-	-	-	-	-
Project 9	-	-	-	-	-	-	-	-	-
Project 10	-	-	-	-	-	-	-	-	-

Category	Description
Electricity Conservation	GHG reductions from electricity conservation or reduced use of energy.
Green Energy	GHG reductions from switching to greener or renewable energy sources.
Stationary Sources	GHG reductions from reduced fuel use in stationary combustion sources.
Mobile Sources	GHG reductions from reduced fuel use or substitution to greener fuels in mobile or transportation sources.
Greening Chemistry	GHG reductions from reduced use of high global-warming-potential (GWP) chemicals.
Water Conservation	GHG reductions from reduced water use.
Materials Management *(under construction)*	GHG reductions from considering the lifecycle GHG impact of materials used.

Ex. 5: Cost Calculator

Fuel Use						
Type of Reduction	Diesel			Biodiesel		
How to use this tab	Enter the gallons of diesel reduced. Enter the unit cost if known or leave blank to populate with the national default value. The Savings column converts data entries into dollars saved.			Enter the gallons of biodiesel reduced. Enter the unit cost if known or leave blank to populate with the national default value. The Savings column converts data entries into dollars saved.		
Calculation Description	Diesel gallons reduced * unit cost (user-specified or default) = Dollars saved.			Biodiesel gallons reduced * unit cost (user-specified or default) = Dollars saved		
Default Unit Cost	$3.786 /gal			$4.265 /gal		
	Reduced Gallons of Diesel	Unit Cost ($/gal)	Dollar Savings	Reduced Gallons of Biodiesel	Unit Cost ($/gal)	Dollar Savings
Example						
Total Input - All Projects	**4,375**		**$ 16,564**	**(4,375)**		**$ (18,659)**
Project 1	4,375.00		$ 16,563.75	-4,375.00		$ (18,659.38)
Project 2			$ -			$ -
Project 3			$ -			$ -
Project 4			$ -			$ -
Project 5			$ -			$ -
Project 6			$ -			$ -
Project 7			$ -			$ -
Project 8			$ -			$ -
Project 9			$ -			$ -
Project 10			$ -			$ -

Ex. 5: Cost Calculator – Aggregate Tab

Aggregated P2 Cost Savings

This tab calculates the cost saving results per project from all tabs. To name a project, enter the project name in the first column. The name entered will appear automa
tabs. For example if Project 1 is named Electricity Conservation, the Project 1 field in all tabs will be populated as "Electricity Conservation".

	Hazardous Inputs	Hazardous Waste	Air Emissions	Water Pollution	Water Use	Fuel Use	Electricity Use	Total by Project
	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)
Aggregate (all projects)	$ -	$ -	$ -	$ -	$ -	$ (2,096)	$ -	$ (2,096)
Project 1	$ -	$ -	$ -	$ -	-	$ (2,096)	$ -	$ (2,096)
Project 2	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 3	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 4	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 5	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 6	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 7	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 8	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 9	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -
Project 10	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -

Reducing and Substituting Away from High-GWP Chemicals Projects

- **P2 GHG Calculator: Greening Chemistry Tab**
  - Total of 95 chemicals in the Tool
  - Emissions of gases are translated into CO_2 equivalents using Global Warming Potentials
  - The 100-year GWP is a measure of the global warming impact of a gas, relative to CO_2

Note: Cost reductions associated with the reduction of specific chemicals has not been incorporated into the P2 Cost Calculator.

Example 6: Reducing and Substituting Away from High-GWP Chemicals

Through the combination of refrigerant tracking and improved leak detection, GMC saved 10,000 pounds of HFC-134a. They also replaced 1000 pounds of CFC-12 with HFC-134a.

INPUT

GHG Calculator: Greening Chemistry Tab

CFC-12

lbs. Chemical Avoided = 1,000

HFC-134a

lbs. Chemical Avoided = 9,000

OUTPUT

GHG Calculator (Aggregate Tab) = 10,251.360 $MTCO_2e$ (in emission reduction)

Ex. 6: GHG Calculator

Greening Chemistry: GHG Savings from Reduced Emission of GHG Chemicals Directly

This tab calculates GHG reductions from reducing use of high GWP chemicals and from switching to chemicals with little to no global warming impact. The Greening Chemistry tab determines the CO_2 equivalency of 95 chemicals listed by the International Pa [Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Chlorofluorocarbons (CFCs), numerous Hydrofluorocarbons (HFCs), r (PFCs), and Sulfur Hexafluoride (SF_6)] and those listed by EPA's GHG Reporting Program.

How to use this tab: Instructions to obtain $MTCO_2e$	Enter the mass of each chemical avoided for a project in the column "lbs. Chemical Avoided." Total lbs CO_2e avoided and MTC
Calculation Description	$MTCO_2e$ = lbs.Chemical Avoided * (100-year Global Warming Potential)[a] * (0.4536 kg / lbs.) * (1 $MTCO_2e$ / 1,000 kg CO_2)
Example	GQ Co. improved leak detection for their use of sulphur hexafluoride in their own electrical distribution equipment, saving 600

Industrial Chemical Reduced	IPCC, EPA Reporting Program GHG Registry or all	Chemical Formula	CAS #	Global Warming Potential (100 year)	All Projects	Project 1	Projec
					Total GHG Reduction ($MTCO_2e$)	GHG Reduction ($MTCO_2e$)	GHG Reducti ($MTCO_2e$)
ALL CHEMICALS					**10,251.360**	**10,251.360**	
					Total lbs. CO_2e Avoided	lbs. CO_2e Avoided	lbs. CO_2e Av
ALL CHEMICALS					22,600,000	22,600,000	
					lbs. Chemical Avoided	lbs. Chemical Avoided	lbs. Chemical
Carbon dioxide	Both	CO2	124389	1	-		
Methane	Both	CH4	74828	21	-		
Nitrous oxide	Both	N2O	10024972	310	-		
CFC-11	IPCC	CCl3F	75694	4,750	-		
CFC-12	IPCC	CCl2F2	75718	10,900	1,000	1,000	
CFC-13	IPCC	CClF3	75729	14,400	-		
HFC-134a	Both	CH2FCF3	811972	1,300	9,000	9,000	
HFC-143a	Both	CH3CF3	420462	3,800	-		
HFC-152a	Both	CH3CHF2	75376	140	-		
HFC-227ea	Both	CF3CHFCF3	431890	2,900	-		
HFC-236fa	Both	CF3CH2CF3	690391	6,300	-		

Water Conservation Projects

- **P2 GHG Calculator: Water Conservation Tab**
  - Water and energy conservation are linked through the energy that it takes to pump, treat and transport water
  - The calculator does not account for the heating of water this is captured in the electricity tab
  - Calculator does not need to account for alternative heat because it has the same impact of cold water.

- **P2 Cost Calculator: Water Use Tab**
  - Calculates savings from reductions of incoming raw water (does not take into account heating water, but merely the amount of water that comes in originally) through a P2 activity

Example 7: Water Conservation

GMC improved cooling tower efficiency in their New Jersey plant through the installation of magnetic pulse technology and saved 35,000,000 gallons of water.

INPUT

GHG Calculator: Water Conservation Tab

Water Conservation

State or US = NJ

Non-heated Water Reduced (gallons) = 35,000,000

Cost Calculator: Water Use Tab

Water Use

State or US = NJ

Gallons Reduced = 35,000,000

OUTPUT

GHG Calculator = 66.485 $MTCO_2e$ (in emissions reductions)

Cost Calculator = $71,122.99 (in cost savings)

Ex. 7: GHG Calculator

Water Conservation: GHG Savings from Reduced Water Use

This tab converts water conservation into GHG emission reductions. The factor for converting gallons of water to kWh of energy is a national-survey average of the energy required to pump raw water to a treatment plant and distribute the water. This tab allows a user to choose either a national or state grid emission factor, which the tool will apply in its formula to convert kWh of energy used to $MTCO_2e$ emissions.

Unless hot water use is metered separately, it may be difficult to determine the energy use attributable to heating water from a gas or electricity bill. Therefore, this tool treats gas and electricity savings from heating less water as part of overall gas and electricity savings (which the user will capture in the Stationary Source and Electricity Conservation tabs). Only the quantity of water reduced is accounted for in this tab.

Water Use		Water Conservation (non-heated water)		Other Calculator	
How to use this tab: Instructions to obtain $MTCO_2e$		Select a state or U.S. National to designate where water was conserved. Enter gallons of non-heated water conserved. "GHG Reduction" converts the reduction into $MTCO_2e$.		Please describe your methodology and source if you are using an alternate calculator. Enter your input and $MTCO_2e$ values on the project rows.	
Calculation Description		$MTCO_2e$ = Water Conserved (gal.) * (3,300 kwh / 1,000,000 gal. water used)* [either National or Regional emissions factor] National Conversion factor: 0.000692 $MTCO_2e$/kwh Regional Conversion factor: (0.000498 to 0.00090 $MTCO_2e$/kwh)			
Example		GQ Co. reduced blow-down losses in boilers at NY plants through acidification of water, saving 30 million gals of water.			
	NY	30,000,000	**58.344**		
Total Input- All Projects	**State or U.S. (Select)**	Non-heated Water Reduced (gallons)	GHG Reduction ($MTCO_2e$)	Input	GHG Reduction ($MTCO_2e$)
		35,000,000	**66.485**	-	-
Project 1	**NJ**	35,000,000	66.485		
Project 2			-		

Ex. 7: Cost Calculator

	Water Use			
	This tab calculates cost savings from reduced water usage. Typically, the gallons of water entered on this tab will equal the gallons of water entered on the Water Pollution Tab.			
Type of Reduction		Water Use		
How to use this tab		Enter gallons of incoming raw water saved. Enter the unit cost of pumping water if known, or select a State or the US National default to populate unit cost with the default state or national value. The Savings column converts data entries into dollars saved.		
Calculation Description		Gallons reduced * unit cost (user specified or state/national default value) = Dollars saved.		
	State or U.S. (select)	Gallons Reduced	Unit Cost ($/gal)	Dollar Savings
Example	Adopted water conservation technology in WI plant, reducing process water use by 3 million gallons annually.			
	WI	**3,000,000**		**$ 6,122**
Total Input - All Projects				**$ 71,123**
Project 1	NJ	35,000,000.00		$ 71,122.99
Project 2	(Select)			-
Project 3	(Select)			-
Project 4	(Select)			-
Project 5	(Select)			-
Project 6	(Select)			-
Project 7	(Select)			-
Project 8	(Select)			-
Project 9	(Select)			-

Water Pollution Reducing Projects

- **P2 Cost Calculator – Water Pollution Tab**
  - Calculates savings from reduced discharges of water pollutants
  - **Waste Water includes** contaminants in water and storm water discharged to sewer systems, septic systems, injection wells, and ground water
  - **Water Pollutants include** biochemical oxygen demand (BOD), chemical oxygen demand (COD), toxics, nutrients, total suspended solids (TSS)

Note: GHG reduction is not applicable to Water Pollution, thus this activity is not represented in the GHG Calculator. Similarly, other activities not represented in the GHG Calculator include Hazardous and Non-Hazardous Waste Reduction and Air Pollutants (NO_x SO_x, VOCs, PM_{10}, VOCs, HAPs).

Example 8: Water Pollution Reduction

Through the adoption of a new filtration system in one of its plants, GMC reduced the quantity of BOD/COD discharged by 500 pounds.

INPUT

Cost Calculator: Water Pollution Tab

BOD/COD

State or US = NJ

Quantity Reduced = 500

Units = lbs.

OUTPUT

Cost Calculator = $135

Ex. 8: Cost Calculator

Water Pollution

This tab calculates cost savings from reducing pollutant or nutrient discharges to water, expressed as wastewater, BOD/COD, TSS, toxics, and nutrients. Typically, the gallons of water entered on this tab equal the gallons of water entered on the Water Use tab.

		Wastewater Discharge			BOD/COD (Biological Oxygen Demand or Chemical Oxygen Demand)				
Type of Reduction									
How to use this tab		Enter gallons reduced. Enter the unit cost of wastewater treatment or select a State or US National default to populate unit cost with a state or national default value. The Savings column converts data entries into dollars saved.			Enter the quantity of BOD/COD reduced, selecting the appropriate unit. Enter the unit cost if known or select a State or the US National default to populate unit cost with the state or national default value. The Savings column converts data entries into dollars saved.				
Calculation Description		Gallons reduced * unit cost (user-specified or default) = Dollars saved.			Quantity of BOD/COD reduced (in user-specified units) * unit cost (user-specified or default) = Dollars saved. The calculator formula converts all units to pounds.				
	State or U.S. (Select)	Reduced Gallons of Wastewater	Unit Cost ($/gal)	Dollars Savings	Reduced Quantity of BOD/COD	Units (select)	Unit Cost ($/unit just entered)	Pounds Reduced	Dollar Savings
Example	Adopted "electrocoagulation" technology in metal finishing shop in New								
	WI	5,000,000		**$ 17,656**					
Total Input - All Projects		-		**$ -**				500	**$ 135**
Project 1	NJ			$ -	500.00	lbs		500.00	**$ 135**
Project 2	(Select)			-		(Select)		-	-
Project 3	(Select)			-		(Select)		-	-
Project 4	(Select)			-		(Select)		-	-
Project 5	(Select)			-		(Select)		-	-
Project 6	(Select)			-		(Select)		-	-
Project 7	(Select)			-		(Select)		-	-
Project 8	(Select)			-		(Select)		-	-
Project 9	(Select)			-		(Select)		-	-
Project 10	(Select)			-		(Select)		-	-

GHG Calculator: Aggregate Tab for All Example Projects

Aggregated GHG Reductions by Category and Project

This tab calculates the GHG saving results per project from all tabs. To name a project, enter the project name in the first column. The name entered will appear automatically as the project name on all other tabs. For example, if Project 1 is named "Line 2 Upgrade", the Project 1 field in all tabs will be populated as "Line 2 Upgrade".

	Electricity Conservation	Green Energy	Stationary Sources	Mobile Sources	Greening Chemistry	Water Conservation	Materials Management (*under construction*)	Total by project	Total by project
	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)	Reduction in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$)*	Reduction in Million Metric Tons of Carbon Dioxide Equivalent ($MMTCO_2e$)**
Aggregate (All Projects)	14.391	23.025	79.812	203.559	10,251.360	66.485	-	10,638.632	0.011
Project 1	14.391	23.025	79.81	203.559	10,251.360	66.485	-	10,638.632	0.011
Project 2	-	-	-	-	-	-	-	-	-
Project 3	-	-	-	-	-	-	-	-	-
Project 4	-	-	-	-	-	-	-	-	-
Project 5	-	-	-	-	-	-	-	-	-
Project 6	-	-	-	-	-	-	-	-	-
Project 7	-	-	-	-	-	-	-	-	-
Project 8	-	-	-	-	-	-	-	-	-
Project 9	-	-	-	-	-	-	-	-	-
Project 10	-	-	-	-	-	-	-	-	-

Cost Calculator: Aggregate Tab for All Example Projects

Aggregated P2 Cost Savings

This tab calculates the cost saving results per project from all tabs. To name a project, enter the project name in the first column. The name entered will appear automatically as the project name on all other tabs. For example if Project 1 is named Electricity Conservation, the Project 1 field in all tabs will be

	Hazardous Inputs	Hazardous Waste	Air Emissions	Water Pollution	Water Use	Fuel Use	Electricity Use	Total by Project	Non-Hazardous	Non-Hazardous
	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)	cost savings ($)
Aggregate (all projects)	$ -	$ -	$ -	$ 135	$ 71,123	$ 30,987	$ 2,593	$ 104,838	$ -	$ -
Project 1	$ -	$ -	$ -	$ 135	$ 71,123	$ 30,987	$ 2,593	$ 104,838	$ -	$ -
Project 2	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 3	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 4	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 5	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 6	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 7	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 8	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 9	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -
Project 10	$ -	$ -	$ -	$ -	-	$ -	$ -	$ -	$ -	$ -

Hazardous Materials: Gallons to Pounds

- Engineering tool-kit
  - Common solvents
  - Fuels and oils
  - Refrigerants
  - House hold paints
  - Auto paints
  - Metal working fluids
  - Liquids

Location of P2 Tools

- http://www.epa.gov/p2/pubs/resources/measurement.html#calc

- http://www.p2.org/general-resources/p2-data-calculators/

Contact

- Natalie Hummel, EPA, P2
- 202-564-1424
- Hummel.Natalie@epa.gov